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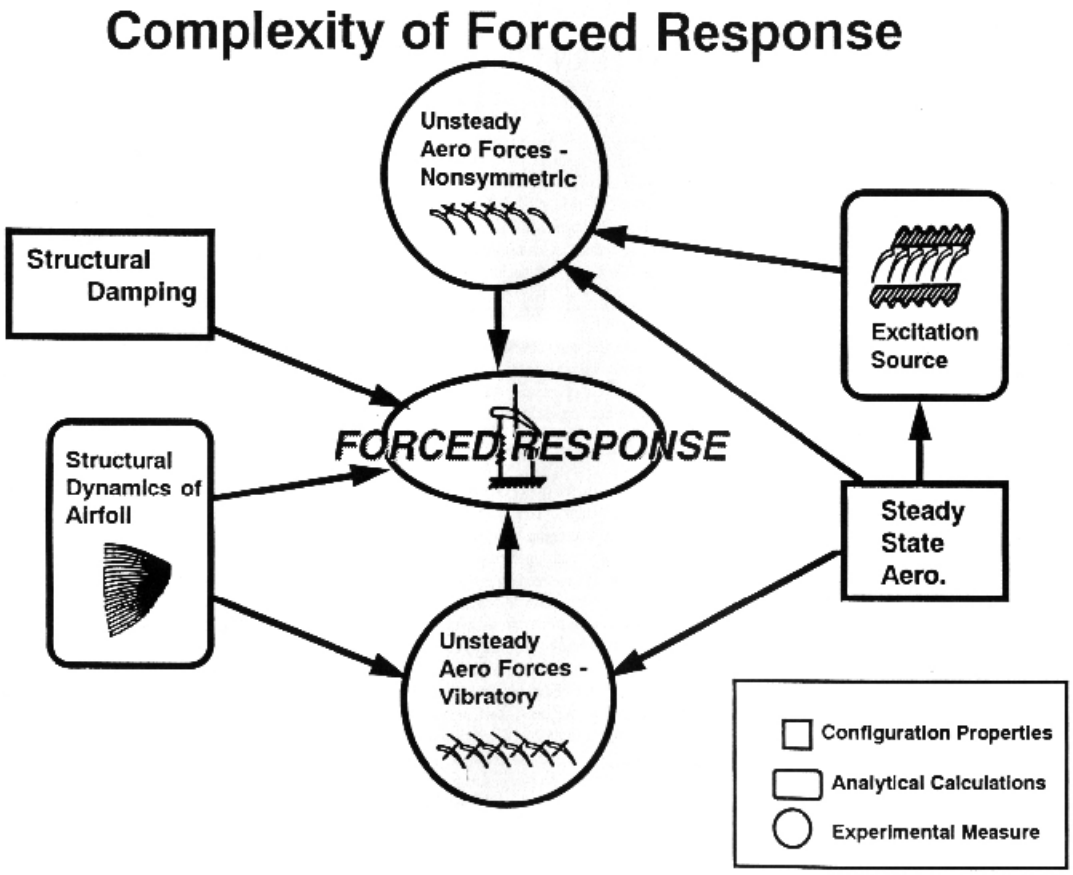
Success Story

Government, Industry and Universities Team to Predict and Mitigate Turbine Engine Blade Vibrations



Payoff

The Guide Forced Response Consortium represents an opportunity for the turbine engine community to collaboratively develop the analytical tools needed to predict the forced response of a turbine engine and mitigate blade vibrations. The development of a prediction system will reduce the number of costly rig and engine tests required to validate each new engine component design and will lead to superior structural designs for future high performance turbine engines. Shown above is a diagram depicting the elements needed to create a forced response prediction system.

Accomplishment

The Aero Propulsion as Power Directorate was instrumental in the formation of the Guide Forced Response Consortium to coordinate research in the area of forced response analysis and prediction for turbine engines. Seven turbine engine companies, Carnegie Mellon University, Purdue University, and the United States Government signed an agreement to to conduct research necessary to maintain the structural integrity of future high performance turbines engines.

Background

The joint DOD, NASA, and industry initiative, Integrated High Performance Turbine Engine Technology (IHPTET), has the goal of doubling the propulsive capability of gas turbine engines shortly after the turn of the century. In order to accomplish this goal, new designs and technologies have increased and complicated the aeromechanical loading of turbine engine components. These newly highly loaded stages, swept airfoils, integrally bladed disks, and composite materials are just a few of the innovations which have changed and complicated the vibrational response of turbine engine disks and blades. To prevent duplication of effort and maximize research benefits, the turbine engine community joined together under the consortium to understand the mechanisms of forced response vibrations. The consortium consists of seven turbine engine companies (Allied Signal, Allison Gas Turbine Division, General Electric Aircraft Engines, Pratt and Whitney, Teledyne, Textron Lycoming, and Westinghouse), the Air Force, NASA, Purdue University (Aerodynamic Research Center) and Carnegie Mellon University (Structural Research Center) will research efforts subcontracted out of top research facilities and universities. Research efforts by the consortium are jointly funded by the government (Air Force and NASA) and contributions from the participating industrial members. All efforts are directed toward the end goal of combining finite element methodology and computational fluid dynamics to predict forced response of turbine engine blades.

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Additional information

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